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## Two new species of *Austroaeschna* SELYS from Queensland, Australia (Odonata: Aeshnidae: Brachytroninae)

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**A b s t r a c t :** Adults and last instar larvae of two new species of *Austroaeschna* SELYS are described from the Eungella area in north-eastern Queensland. *Austroaeschna christine* n. sp. is most similar to *A. sigma* THEISCHINGER, and *Austroaeschna eungella* n. sp. closely resembles *A. pulchra* TILLYARD.

**K e y   w o r d s :** *Austroaeschna*, new, adults, larvae; Australia.

### Introduction

As early as 1980, larval exuviae of two species of *Austroaeschna* SELYS were collected in the Eungella area of north-eastern Queensland. One of them was similar in some respects to *A. pulchra* TILLYARD, whereas the other closely resembled *A. sigma* THEISCHINGER. Several *Austroaeschna* males collected in the Eungella area in 1980 and 1982 appeared close to, but not necessarily identical with, *A. pulchra*. Numerous attempts in the following ten years to obtain more adults of *Austroaeschna* from the Eungella area were unsuccessful, although more larval exuviae were found. WATSON & THEISCHINGER (1984) therefore listed *Austroaeschna pulchra* and *A. sigma* from Eungella, in order to give evidence of taxonomic disjunction in Australian Odonata between Paluma and farther north and Eungella and farther south, but neither species was recorded from north-eastern Queensland by THEISCHINGER (1982) or WATSON et al. (1991).

Fortunately, in April 1993, adults of both sexes of two *Austroaeschna* species were obtained in the Eungella area. Comparison of these specimens with ma-

terial of *A. pulchra*, *A. sigma* and cognate species from farther south revealed marked and consistent differences in structure and colour pattern. The magnitude of these differences, and the differences between the relevant larvae indicate that the hitherto undescribed populations of *Austroaeschna* from the Eungella area are distinct from any other known species. Two new species are, therefore, described below.

The terminology used in the descriptions follows CHAO (1953) and WATSON & O'FARRELL (1991).

The material referred to is held in the Australian National Insect Collection, Canberra (ANIC), in the Australian Museum, Sydney (AM), and in the collection of the author (GT).

***Austroaeschna christine* n. sp. (Figs 1-9, 23-26)**

*Austroaeschna sigma*; WATSON & THEISCHINGER, 1984: 150.

Types - Holotype ♂: Queensland, Dalrymple Road, near Eungella, 3.4.1993, G.Theischinger (ANIC Type No. 9795). Paratypes: 3♂, 3♀, same data as holotype (ANIC, GT).

Other material examined: Numerous final instar larval exuviae: Queensland, Mt Dalrymple and Finch Hatton Gorge, 1980-1992, G. Theischinger and L. Müller (AM, ANIC).

Most similar to *Austroaeschna sigma* THEISCHINGER but differing in structure, particularly of the glans penis, and in the colour pattern of the abdomen, notably tergite 9 of male and tergite 8 of female.

Name: After my wife, Christine; to be treated as a noun in apposition.

**Male**

Dimensions: Hindwing 39,8-40,1 mm (N = 4); abdomen 45,7-46,5 mm (N = 4).

Head: Labium yellowish- to reddish brown; mandibles black; labrum brownish black with yellowish green subtrapezoid mark near base on either side of narrow midline; anteclypeus brownish black; postclypeus largely pale green, along epistomal suture narrowly black, along lateral and most of lower margins broadly black; genae brownish black; anterior frons black with sides pale green, top of frons black with two small pale green marks; vertex and antennae black; occiput short and broad, densely hirsute, black; postgenae black.

**Cervix and prothorax:** Cervical sclerites dull yellowish- to greyish brown; pronotum largely greyish brown, parts of anterior and median lobe and entire posterior lobe greyish- to brownish black, rim of anterior lobe yellow; episternum and epimeron yellowish grey to dark brownish grey and blackish brown; basisternum black; coxa pale greyish green to pale brown on outer face, otherwise brownish black; trochanter pale reddish brown; femur basally reddish brown, merging into black distally; tibia largely dark reddish brown, black at base, merging into black distally; tarsus black; claws reddish brown.

**Synthorax:** Spiracular dorsum black; mesostigmatic lamina largely brown, somewhat paler along anterior margin; collar brown; dorsal carina brownish yellow in anterior half, brownish black in posterior half; antealar ridge dark brown; antealar sinus entirely brown or brown with yellowish green central spot; front of synthorax blackish brown with narrow pale bluish green anterior stripe which may be much broadened in dorsal half or reduced to two marks, and with moderately wide yellowish- to bluish green S-shaped posterior stripe reaching from collar to near antealar ridge; mesepimeron blackish brown with broad, strongly curved band in dorsal half; mesokatepisternum blackish brown with yellowish green mark at base; metepisternum blackish brown to black with larger subtriangular pale yellowish green mark ventral to spiracle and smaller subcircular greenish yellow mark dorsal to spiracle, and with bluish green subtriangular mark close to subalar ridge which is blackish brown, dorsal lobe greenish yellow; metepimeron blackish brown to black with two greenish yellow marks, a larger oval patch in ventral half and a subcircular spot in dorsal half; metakatepisternum black, along sutures narrowly brown; metapostepimeron brown to black; poststernum pale reddish- to greyish brown; mesoscutum, mesopostnotum and metascutum yellowish green, remaining tergal surface brown to black; metapoststernum pale reddish brown; coxae largely brownish black, mesocoxa with greenish yellow posterobasal spot on outer face; postcoxae black; trochanters black at base, otherwise reddish brown; femora reddish brown, only extreme apex blackened; tibiae reddish brown with extreme base black; tarsi black; claws reddish brown.

**Wings:** Humeral plates brown, that of forewing with greenish yellow spot in anterolateral corner; axillary plates black with distinct yellowish green spot which is much smaller in forewing than in hindwing; intermediary plates black; membrane hyaline; venation brownish black, costa of both wings without distinct median ray; antenodals 18-21/12-14; postnodals 15-21/15-20;

Ax1 and Ax5 or Ax6 thickened in forewing, Ax1 and Ax5 in hindwing; pterostigma greyish black, 2,0-2,2 mm long in forewing, 2,2-2,4 mm long in hindwing, overlying 3-5 cells in both wings; anal loop of 6-7 cells, 2-3 cells long, 2-4 cells wide; membranules greyish white.

**A b d o m e n :** Segments 1 and 2 swollen, 3 constricted near base, 4-10 from compressed at 4 to cylindrical at 10. Tergites blackish brown to black except for the markedly paler anterodorsal portion of tergite 2, with whitish to pale yellowish green markings as follows: tergite 1 with large lateral patch along ventral margin; tergite 2 with anterodorsal and posterodorsal line on longitudinal carina and, on each side, a mediodorsal line just behind transverse carina, connected with a patch dorsal to the black auricle, a small posterodorsal mark and a longitudinal stripe near ventral margin; tergite 3 with a large mediodorsal mark continuing ventrad along transverse carina and anterior half of ventral margin, and with a small posterodorsal mark each side; tergites 4-7 similar to each other, on each side with a subtriangular to parallelogram-shaped mediodorsal mark continuing along transverse carina and connected to a larger subtrapezoid lateral mark along part of ventral margin; tergite 8 similar to tergites 4-7 but with the mediodorsal marks much larger and square to circular; tergite 9 similar to tergite 8 but with the mediodorsal marks smaller and more widely separated along midline and with the lateral mark some distance from the ventral margin; segment 10 black, generally with a very small and inconspicuous mark each side of a substantial narrow, slightly backwardly directed cone. Sternite 1 brown; secondary genitalia largely brown to black, glans penis with tips short and rather pointed; sternites 3-9 and bipartite sternite 11 black.

**A n a l a p p e n d a g e s :** Superior appendages 4,1-4,3 mm long, black, convergent in basal fourth, then slightly angulated and almost straight to slightly convergent again; inferior appendage black, narrow, slightly arched and emarginate.

### **Female**

**D i m e n s i o n s :** Hindwing 41,5-42,6 mm (N = 4); abdomen 41,2-42,1 mm (N = 4).

**H e a d :** Much as in male; occiput with virtual wall of black hairs each side pointing backward, a small tooth each side on postgena some distance from occiput.

**Cervix, prothorax and synthorax:** Much as in male.

**Wings:** Much as in male; antenodals 15-19/12-14; postnodals 15-20/15-21; Ax1 and Ax4, Ax5 or Ax6 thickened in forewing, Ax1 and Ax4 or Ax5 in hindwing; pterostigma 2,4-2,7 mm long in forewing, 2,6-3,0 mm long in hindwing; anal loop made up of 5-8 cells.

**Abdomen:** Shape similar to that of male, but somewhat shorter and stouter and with segments 8 and 9 swollen. Colour and colour pattern much as in male but tergite 2 not much paler anterodorsally than elsewhere, mediodorsal marks of tergite 8 separated or not separated along midline, and tergite 9 without mediodorsal marks, only with an inconspicuous posterodorsal spot each side; segment 10, supraanal plate and the very short and obtuse anal appendages black.

**Genitalia:** Dentigerous plate black, with 3-5 large teeth on each side; valves and styli black; terebra reaching to end of segment 10.

#### **Larva (described from final instar exuviae)**

Total length 31,8-35,0 mm; length of abdomen 21,0-23,0 mm; width of head including eyes 6,8-7,1 mm; greatest width of abdomen 6,3-6,6 mm. Colour of head, thorax and abdomen yellowish- to greyish brown with small inconspicuous darker and lighter markings; legs dark greyish brown, femora speckled, tibiae banded with dull yellow. Labium extending posteriorly to mesocoxae; prementum 5,3-5,6 mm long, 2,0-2,1 mm wide at base, 3,6-3,8 mm wide at distal end; ligula convex, two small teeth on each side of a poorly indicated median cleft; palp with endhook well developed, generally ca 16 well defined teeth (including endhook); movable hook slightly shorter than palp. Prothorax with slim horn-like anterior lobe and subtriangular, apically rounded posterior lobe of about the same length. Mesothorax with small triangular tooth at the base of postcoxale. Abdomen with small, moderately slim lateral spines on segments 5-9; all tergites rather evenly arched; female gonapophyses reaching to middle of segment 10 or slightly beyond; male projection shorter than cerci.

*Austroaeschna eungella* n. sp. (Figs 14-18, 29-32)

*Austroaeschna pulchra*, WATSON & THEISCHINGER, 1984: 150.

**Types** - **Holotype** ♂: Queensland, Dalrymple Road, near Eungella, 3.4.1993, G. Theischinger (ANIC Type No. 9796). **Paratypes**: Queensland: 1♂, 2♀, same data as holotype (ANIC, GT); 1♂, Mount Dalrymple, 15.10.1980, G. Theischinger and L. Müller (GT); 2♂, Finch Hatton Gorge, 14.-15.11.1982, 1♂, same locality, Nov. 1982, G. Theischinger and L. Müller (GT).

**Other material examined**: Numerous final instar larval exuviae: Queensland, Mt Dalrymple and Finch Hatton Gorge, 1980-1992, G. Theischinger and L. Müller (AM, ANIC).

Most similar to *A. pulchra* TILLYARD but darker, with the pale markings reduced, and differing in structure, particularly of the occiput of both sexes and the male anal appendages, and in larval characters, notably the proportions of the prementum.

**Name**: From Eungella, in north-eastern Queensland; to be treated as a noun in apposition.

**Male**

**Dimensions**: Hindwing 40.7-41.8 mm (N = 6); abdomen 48.1-50.2 mm (N = 6).

**Head**: Labium including lobes pale to dark reddish brown; mandibles pale greenish yellow to bluish green with apical third and along other margins dark reddish brown; labrum dark reddish- to blackish brown with well-defined oval pale greenish yellow to bluish green mark each side; anteclypeus brownish black, postclypeus either entirely brownish black or brownish black with narrow ill-defined pale bluish green stripe along epistomal suture; genae greyish brown; anterior frons dark reddish brown to black, top of frons black with narrow ill-defined subtriangular bluish green patch each side adjacent to anterior frons; vertex black; antennae brown to black; occiput black with short obtuse, largely blackish brown, dull yellow- to yellowish brown-tipped cone; postgenae black adjacent to the occiput, otherwise pale greenish yellow.

**Cervix and prothorax**: Cervical sclerites pale yellowish- to greyish brown; pronotum largely yellowish- to dark greyish brown, only posterior lobe and part of median lobe darker reddish- to blackish brown; episternum, epimeron and coxa greyish yellow to brown; trochanter blackish brown; basal femur brown above, rest of femur black; tibia and tarsus black; claws dark reddish brown.

**S y n t h o r a x :** Spiracular dorsum, mesostigmatic lamina and collar reddish- to brownish black; dorsal carina and antealar ridge black; antealar sinus black with elongate green central mark; front of synthorax brownish black to black with oblique pale green longitudinal stripe and small green mark just below antealar ridge; mesepimeron blackish brown to black with narrow bluish green longitudinal stripe; mesokatepisternum pale greyish- or greenish yellow to reddish- or greyish brown; metepisternum blackish brown to black with three small bluish green marks, one subtriangular just below blackish brown subalar ridge, one narrow elongate above and another subtriangular below metathoracic spiracle, dorsal lobe generally dark brown or, rarely, with a touch of bluish green; metakatepisternum dark brown; metepimeron blackish brown with blue longitudinal stripe; metapostepimeron blackish brown to black; poststernum brown; mesoscutum, mesopostnotum, metascutum and, to a lesser extent, metapostnotum yellowish green to greenish blue, remaining tergal surface brown to black; coxae and postcoxae yellowish- to greyish brown; trochanters blackish brown to black; femora dark reddish brown in basal two thirds merging into black in distal third; tibiae and tarsi black; claws reddish- to blackish brown.

**W i n g s :** Humeral plates blackish brown to black, forewing with more conspicuous pale greenish yellow spot in anterolateral corner than hindwing; axillary plates black with distinct greenish blue spot which is markedly smaller in forewing than in hindwing; intermediary plates black; membrane hyaline; venation largely black, costa of both wings without median ray; antenodals 19-21/13-15; postnodals 15-19/16-20; Ax1 and Ax5 or Ax6 thickened in forewing, Ax1 and Ax4 or Ax5 in hindwing; pterostigma black, short, 1,8-2,1 mm long in forewing, 1,7-2,0 mm long in hindwing, overlying 2-3 cells in both wings; anal loop generally of 5-6 cells, 2-3 cells long, 2 cells wide; membranules yellowish grey.

**A b d o m e n :** Segments 1 and 2 strongly swollen, 3 constricted near base, then widening, 4 and 5 widening slightly but continuously, 6-10 parallel-sided, cylindrical. Tergite 1 dark brown with black posterior and ventral margin and an irregular bluish green patch in posteroventral corner; tergite 2 dorsally blackish brown, laterally paler brown, with pale greenish blue anterodorsal and posterodorsal line on longitudinal carina, and each side with or without an inconspicuous paler line along supplementary transverse carina and with two greenish blue marks, one covering outer face of auricle and the other slightly

more dorsal and close to posterior margin; tergites 3-8 similar to each other, black dorsally and laterally, brown ventrally, each with two blue subtrapezoid to almond-shaped anterodorsal marks, diminishing in size from tergite 3 to 8, taking between 25 and less than 20% length of segment; tergite 9 dorsally black with a blue mark of variable size along midline, ventrally dark brown; segment 10 black and brown dorsally, paler brown ventrally, dorsal cone distinct but rather flat. Sternite 1 brown; secondary genitalia brown to black, glans penis with tips short; sternites 3-9 black; bipartite sternite 11 brown to black.

**A n a l a p p e n d a g e s :** Superior appendages black, ca 2,5 mm long, slightly angulated at about 1/3 length, from dorsal aspect almost straight and symmetrical, foliate; inferior appendage blackish brown, about half as long as superiors, slightly arched, truncate, emarginate, with small apical dorsal tooth each side.

#### **Female**

**D i m e n s i o n s :** Hindwing 41,4-42,1 mm (N=3); abdomen 47,0-47,6 mm (N=3).

**H e a d :** Much as in male; occiput with median cone similar to that of male, but with a conspicuous thick triangular lobe on each side of it, directed slightly medially.

**C e r v i x , p r o t h o r a x a n d s y n t h o r a x :** Much as in male.

**W i n g s :** Much as in male; membrane conspicuously suffused with greyish brown all over; antenodals 19-21/13-14; postnodals 14-17/14-15; pterostigma brown, 1,9-2,1 mm long in forewing, 1,8-2,0 mm long in hindwing; anal loop made up of 6-7 cells.

**A b d o m e n :** Shape similar to that of male but segments 4-7 narrower and segments 8 and 9 swollen. Coloration and pattern much as in male; pale spots of tergites 3-7 larger, taking up to 30% length of segment; tergites 8 and 9 black, 8 with broad leaf-shaped, 9 with small subtriangular pale greenish blue middorsal mark. Supraanal plate blackish brown, shorter than 2/3 length of anal appendages which are black.

**G e n i t a l i a :** Dentigerous plate narrow, generally 5 large teeth each side; styli black; terebra and valves brown to black, terebra reaching beyond end of tergite 10.

**Larva (described from final instar exuviae)**

Total length 32,0-35,0 mm; length of abdomen 21,0-23,0 mm; width of head including eyes 6,7-7,1 mm; greatest width of abdomen 6,7-7,0 mm. Colour of head, thorax and abdomen yellowish- to pale greyish brown with small darker and lighter markings; legs greyish brown, femora and tibiae banded with dull yellow. Labium extending posteriorly beyond mesocoxae; prementum 6,1-6,3 mm long, 1,7-1,8 mm wide at base, 3,6-3,8 mm wide at distal end; ligula forming a very wide angle, two small teeth on each side of a poorly defined median cleft; palp with endhook well developed, generally ca 18 larger teeth (including endhook); movable hook slightly shorter than palp. Prothorax with slim shorter horn-like anterior process and longer, more extensive rounded posterior lobe. Mesothorax with small obtuse tooth at the base of postcoxale. Abdomen with slim straight lateral spines on segments 5-9, those on 5 very small; tergites 1-8 rather evenly arched, tergites 9 and 10 ridged along midline; female gonapophyses reaching well beyond end of segment 10; male projection longer than cerci.

**Discussion****Affinities and diagnoses of *Austroaeschna christine* n. sp. and *A. eungella* n. sp.**

*Austroaeschna christine* is closely related to *A. multipunctata* (MARTIN), *A. obscura* THEISCHINGER and *A. sigma* THEISCHINGER. In *A. christine* the occiputs are short, wide and hairy, and there is a long S-shaped posterior stripe on the front of synthorax as in *A. sigma*. The apical lobes of the glans penis in *A. christine* are short and rather pointed as in *A. multipunctata* and *A. obscura*. The abdominal pattern of *A. christine*, however, with tergite 9 of male and tergite 8 of female lacking pale posterodorsal marks, is quite unlike that of any of the closely related species. The larva of *A. christine* is most similar to that of *A. sigma*, but the prementum is slightly more elongate (ratio of length to width at the distal end = 1,44-1,50), the posterior lateral process of the pronotum is generally slightly more backwardly directed and the lateral abdominal spines are generally somewhat smaller.

*Austroaeschna eungella* is closely related to *A. pulchra* TILLYARD in MARTIN and *A. muelleri* THEISCHINGER. The occiputs of *A. eungella* are shorter, wider and darker than those of *A. pulchra* but longer than those of *A. muelleri*. The female of *A. eungella* has substantial, slightly medially directed, postocular lobes similar to, but not as large as, those of *A. muelleri*, whereas *A. pulchra* has only very small and narrow horn-like postocular structures generally directed slightly laterally, or, rarely, no postocular processes at all. The larval prementum of *A. eungella* is much stouter (ratio of length to width at the distal end  $<1,7$ ) than those of *A. pulchra* and *A. muelleri* (ratio of length to width at the distal end  $>1,8$ ). In the larvae of *A. eungella* and *A. pulchra* abdominal tergites 9 and 10 and 8-10 respectively are ridged along midline as opposed to evenly arched in *A. muelleri*. Lateral spines on abdominal tergite 5 are well developed in the larva of *A. pulchra* but only very small in the larva of *A. eungella*.

### Zoogeography

Eungella was regarded by WATSON & THEISCHINGER (1984) as harbouring the perhaps northernmost outlier of the odonate fauna characteristic of the montane region of south-eastern Queensland, and the isolation of this fauna from the fauna of north from Paluma was documented in some detail. However, the discovery of the two *Austroaeschna* species described above and one possibly endemic species each of *Austroargiolestes* KENNEDY (THEISCHINGER & O'FARRELL 1986) and *Episynlestes* KENNEDY (THEISCHINGER & WATSON 1985) indicate that there is also a marked isolation of the Eungella fauna from the fauna of the more southern montane region. A similar isolation was noted earlier for the fauna of Carnarvon Gorge (THEISCHINGER & WATSON 1979, WATSON & THEISCHINGER 1984).

The speciation, particularly of brachytronine aeshnids, in such geographically isolated mountain ranges (*Austroaeschna muelleri* THEISCHINGER and *Telephlebia undia* THEISCHINGER in Carnarvon Gorge, *Austroaeschna christine* n. sp. and *A. eungella* n. sp. in Eungella) could suggest that a powerful flight may enable them to avoid passive dispersal.

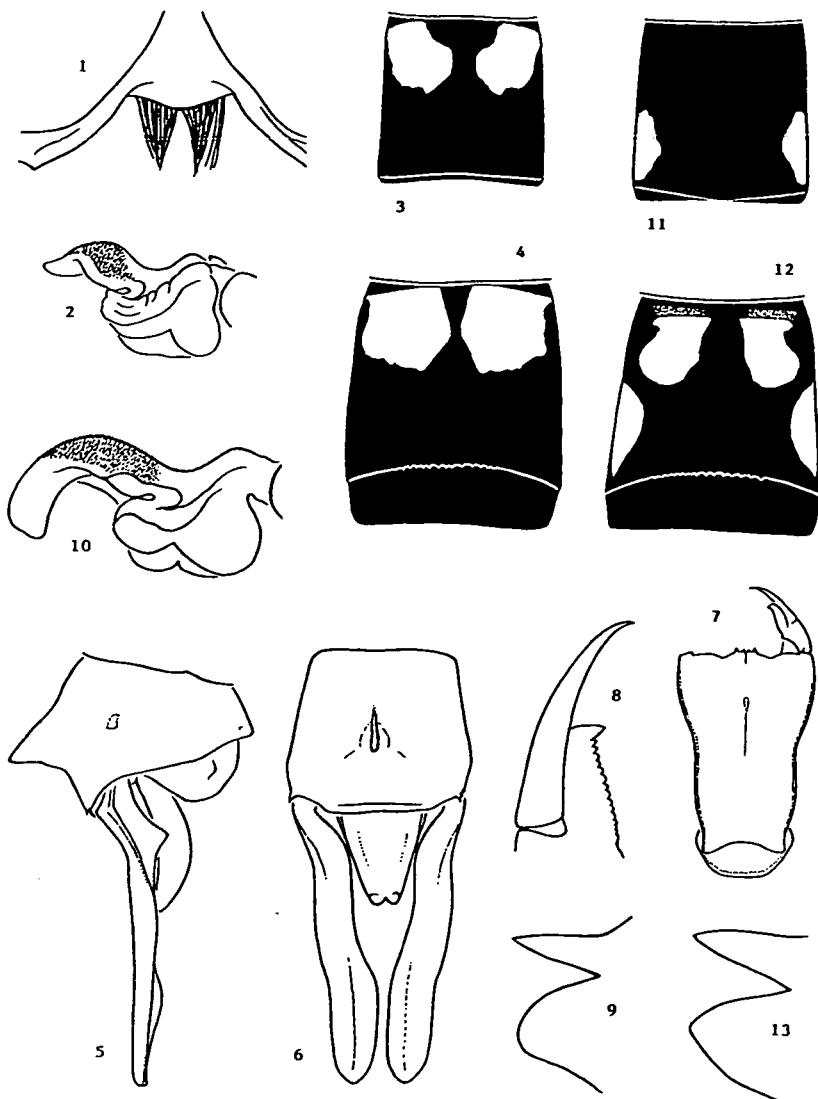
### Acknowledgements

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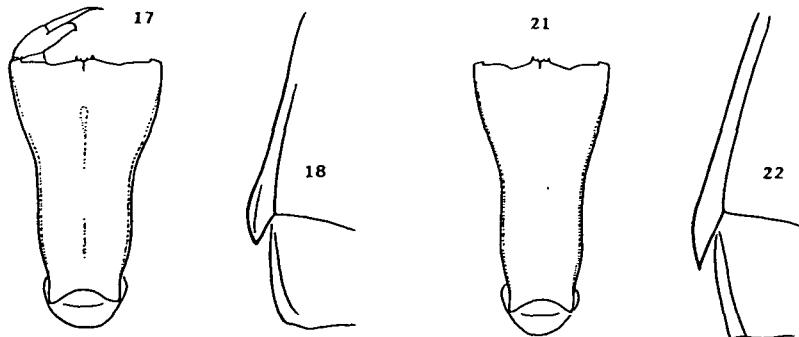
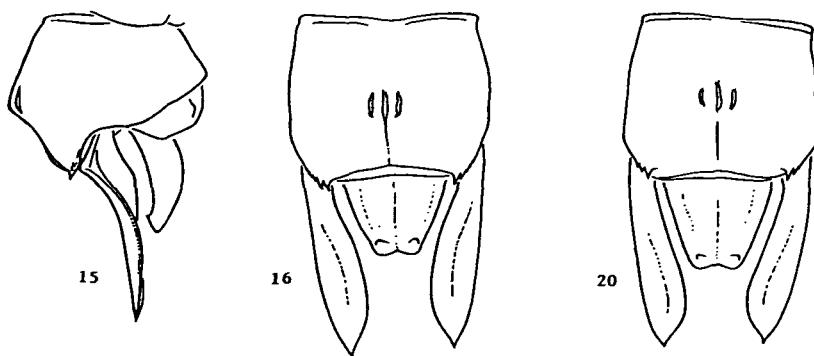
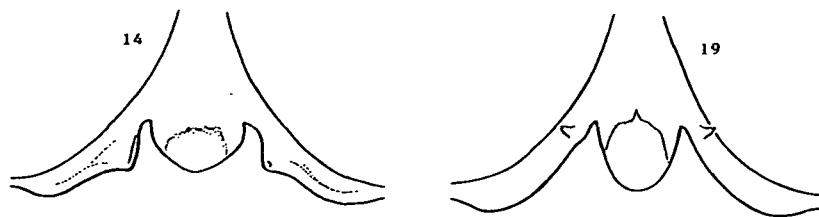
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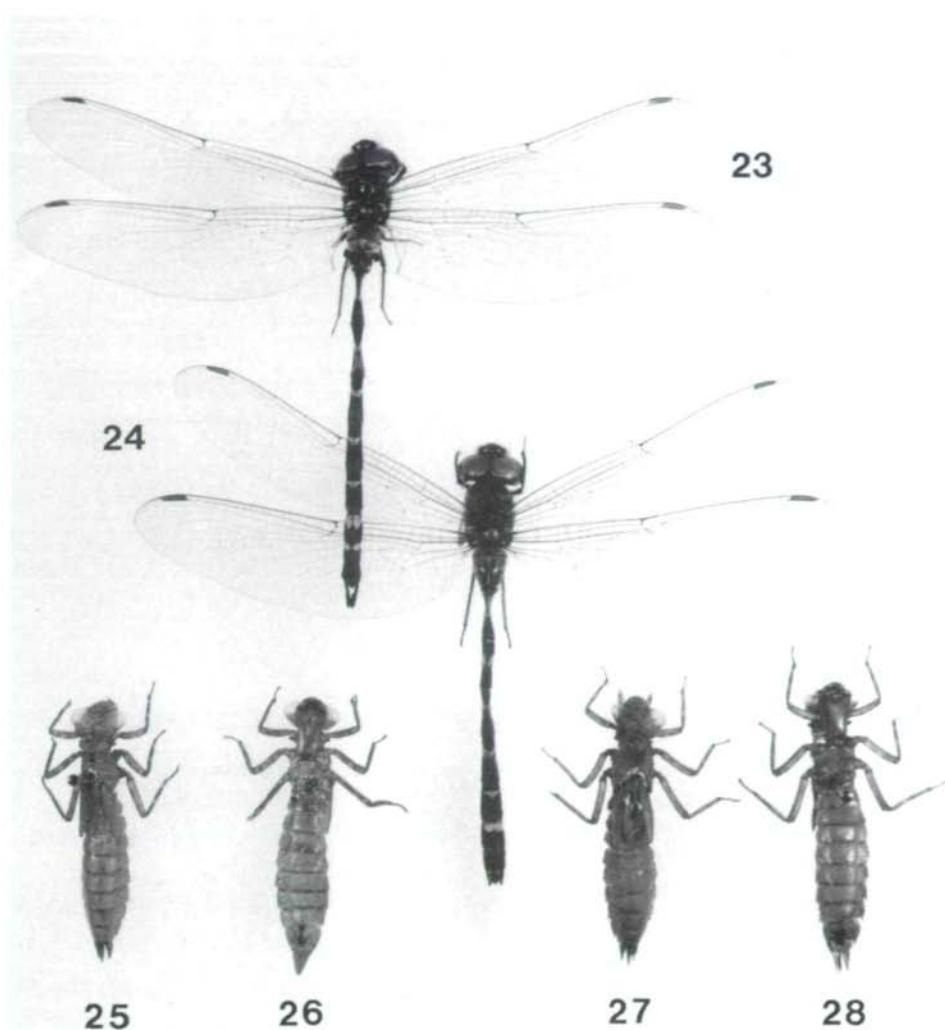
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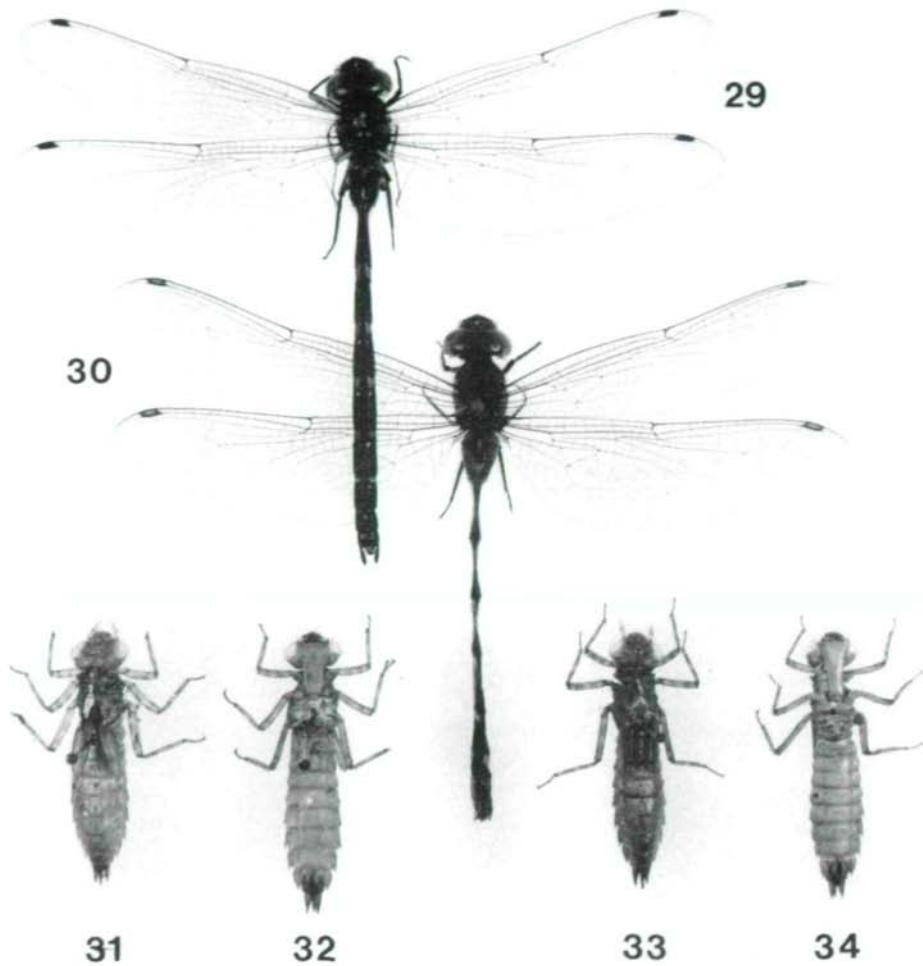
Figs. 1-9: *Austroaeschna christine* n. sp. 1-6: adult: 1: female occiput, dorsal aspect; 2: glans penis, lateral aspect; 3: tergite 9 of male, dorsal aspect; 4: tergite 8 of female, dorsal aspect; 5, 6: male anal appendages: 5: lateral aspect; 6: dorsal aspect; 7-9: final instar larval exuviae: 7: labium and left palp, ventral aspect; 8: distal portion of left labial palp, dorsal aspect; 9: left prothoracic processes, dorsal aspect. Figs 10-13: *Austroaeschna sigma* THEISCHINGER. 10-12: adult: 10: glans penis, lateral aspect; 11: tergite 9 of male, dorsal aspect; 12: tergite 8 of female, dorsal aspect; 13: final instar larval exuviae, left thoracic processes, dorsal aspect.



Figs. 14-18: *Austroaeschna eungella* n. sp. 14-16: adult: 14: female occiput, dorsal aspect; 15, 16: male anal appendages; 15: lateral aspect; 16: dorsal aspect; 17, 18: final instar larval exuviae; 17: labium and right palp, ventral aspect; 18: right lateral spine of abdominal segment 5, ventral aspect. Figs. 19-22: *Austroaeschna pulchra* TILLYARD. 19, 20: adult: 19: female occiput, dorsal aspect; 20: male anal appendages, dorsal aspect; 21, 22: final instar larval exuviae, ventral aspect: 21: labium; 22: right lateral spine of abdominal segment 5.



Figs. 23-26: *Austroaeschna christine* n. sp. 23, 24: adult, dorsal aspect; 23: male; 24: female; 25, 26: final instar larval exuviae; 25: male, dorsal aspect; 26: female, ventral aspect. 27, 28: *Austroaeschna sigma* Theischinger, final instar larval exuviae. 27: male, dorsal aspect; 28: female, ventral aspect.



Figs. 29-32: *Austroaeschna eungella* n. sp. 29, 30: adult, dorsal aspect; 29: male; 30: female; 31, 32: final instar larval exuviae; 31: male, dorsal aspect; 32: female, ventral aspect. 33, 34: *Austroaeschna pulchra* TILLYARD, final instar larval exuviae. 33: male, dorsal aspect; 34: female, ventral aspect.